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A Weekly Journal Devoted to Industrial and Engineering Chemistry

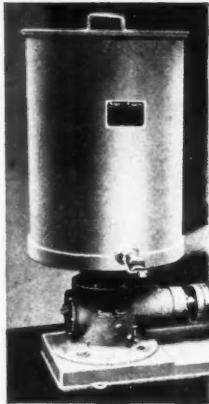
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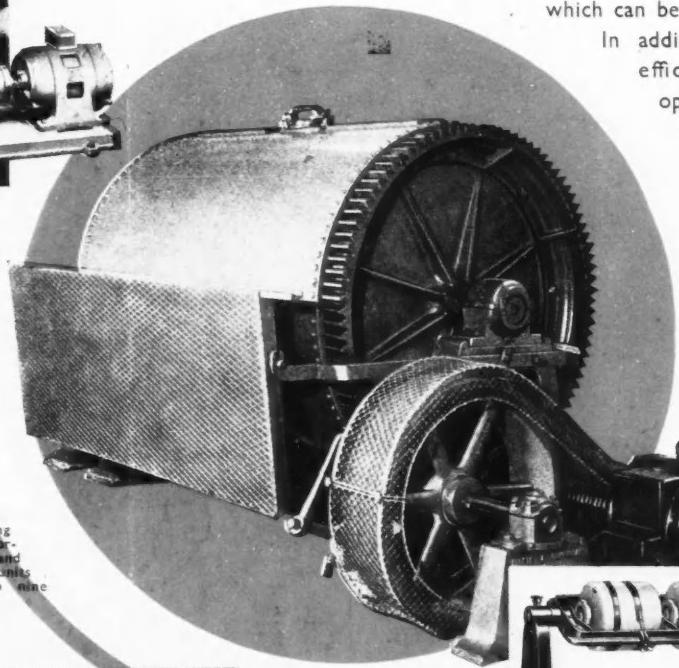
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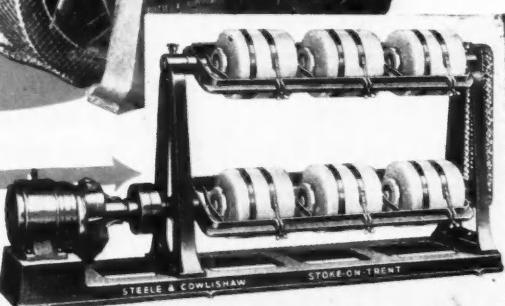
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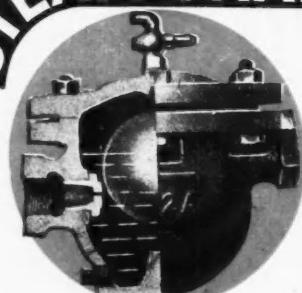
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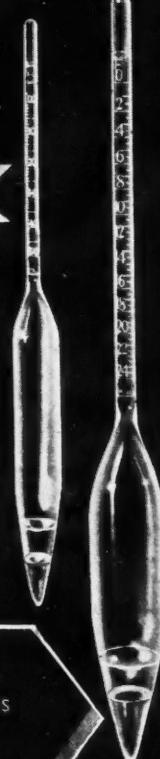
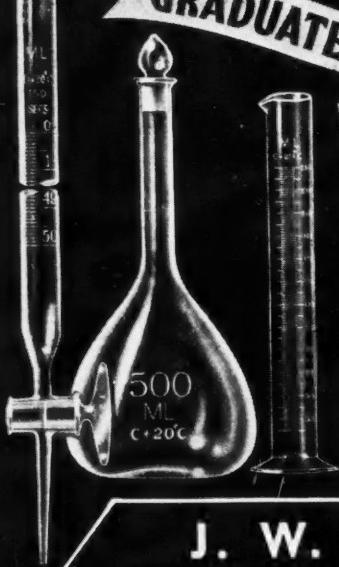
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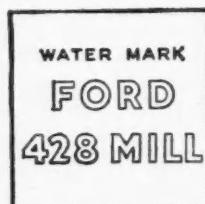
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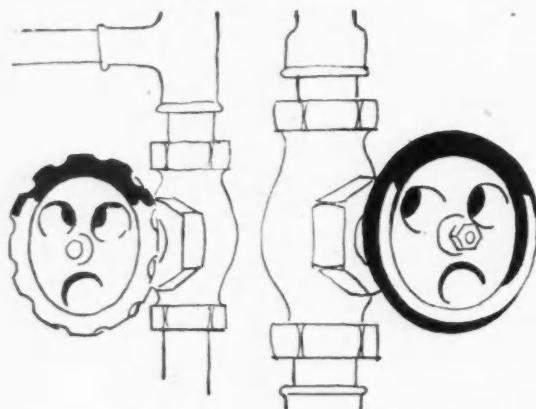


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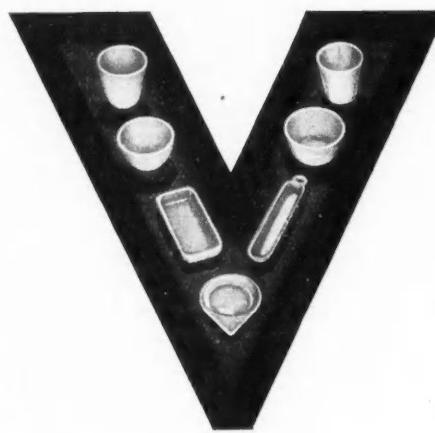
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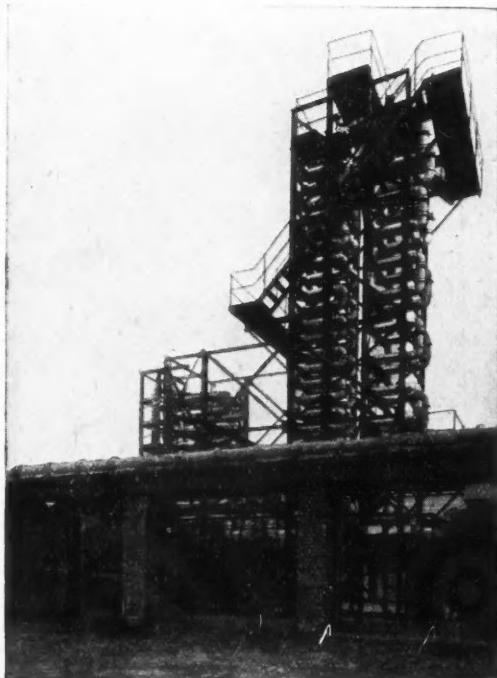
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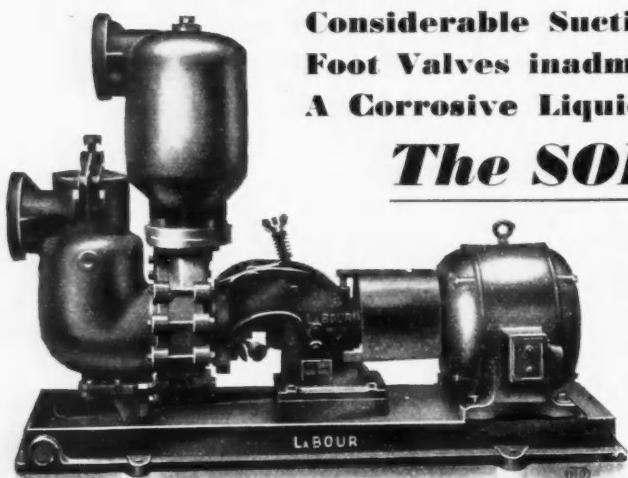
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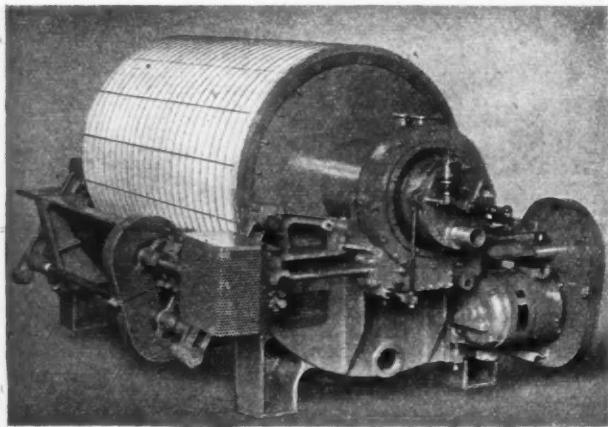
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The Chemical Age

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VOL. XLVI. No. 1196

May 30, 1942

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Trade after the War

INDUSTRIALISTS in all industries and in most countries are anxiously discussing the future organisation of trade. They have a lively recollection of the difficult years that followed the previous war and that have followed every major war since the Industrial Revolution. The Atlantic Charter by its provisions visualised measures which should prevent such a period of unemployment and chaos and remove the economic causes which have led to the present world war. The method by which this is to be accomplished, however, is exceedingly difficult to define.

Countries can be divided into three classes: (1) those which could themselves produce all they require from their own raw materials, industries, and agriculture; (2) those which must import raw materials, manufactured articles, or food, or all three, and which must export goods in order to pay for the imports; and (3) backward countries with simple requirements and a low standard of living. The object of an export trade from the economist's viewpoint is thus ostensibly to pay for necessary imports. In practice, however, a country in the first category, such as the U.S.A., can by modern industrial methods produce sufficient goods to enable its whole population to live in a state of luxury by the labours of only a fraction of the total manpower. In many countries, therefore, the essential reason for an export trade is to maintain employment and to enable the home population to keep up its purchasing power.

The high rate of production by modern industrial methods, if the products could be properly distributed, would enable the whole world to be raised to luxury standards. This is no new discovery; we have ourselves pointed it out in pre-war years on several occasions. In present circumstances, however, it has a lesson for politicians. We hear a great deal of talk about the levelling of classes after the war, but it is obvious that any levelling must be by building up and not by planing down through such methods as repressive taxation of those with higher incomes, such as has been adopted in this country as a war measure.

The high rate of industrial production leads also to a second conclusion, namely, that if the economically advanced nations, which together probably have a population not much more than three or four times that of the U.S.A., were to distribute their goods in such a way as to raise the standard of living to that now considered as "luxurious," the position would very soon be reached that they also would produce the necessary goods without utilising anything like the whole of their available forces. Unemployment would thereby result and we should be back exactly where we are now. The obvious lesson is therefore that the first step must be to raise the standard of backward countries

which are in the third category. In so doing we should bring into the market not 400 or 500 million customers from the economically advanced nations, but 2000 million customers. It has been said on this subject that "there is room in China, in the Balkans, and indeed all over the world, for innumerable Tennessee Valleys, which would give ample employment to the engineering capacity now employed in war work, and thus solve one of the great problems of the transition from war to peace."

A new financial technique would have to be developed, however. These countries could not afford to pay for these vast schemes from their purchasing revenues. It has been pointed out, however, that neither could Germany nor Russia afford to pay for their vast re-armament programme—but they carried those programmes through nevertheless. This war has shown us a new financial technique and it would seem that the countries of the world must no longer handicap themselves by subservience to a gold standard, nor to any other standard than that of the power to produce real wealth. It has been suggested that all the warring countries have increased in real wealth as a result of the war, because of the vast increase in works and productive capacity. Peace-time finance must learn a lesson from this, and there is a growing body of opinion in this country which holds that what is required is not just a new financial technique, but a drastic revision of our old ideas of finance and economics.

One proposal which has been made is that producers should be organised nationally and internationally, operating on fixed prices which would be remunerative, but not excessive, and operating on quotas, thus assuring them of steady markets. Surpluses could and would be produced and these surpluses instead of now being destroyed, or dumped on an already weak market, should be used by an international body, a World Development Committee to satisfy the needs and promote the developments of backward countries. To

stop the pernicious system of debtor and creditor countries, which was responsible for so much of pre-war troubles, it is further suggested that the International Committee be empowered to impose a levy on all favourable trade balances graduated with reference both to the size of the balance and to the external debt of the country concerned, such a levy to be used for developing the backward countries. Moreover, gold should not be the only means of settling international debts. The International Committee should be empowered to fix the price of all materials periodically so that, again under their jurisdiction, whatever goods a country produces could be used through the Committee to liquidate external debts.

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NOTES AND COMMENTS

Chemical Fire Extinguishers

THE attitude of officialdom towards chemical fire-extinguishing materials takes a good deal of explaining. It is a fact that there are certain chemical preparations on the market which will in almost every instance deal satisfactorily with the ordinary magnesium incendiary bomb, extinguishing it rapidly and completely. Expert handling is not required and documents are in existence showing the satisfaction of various municipal authorities with the results obtained. Moreover it is whispered that certain Government establishments (as distinct from Government offices) actually use such a chemical preparation exclusively for dealing with fires in aluminium and magnesium powders. Yet the Minister of Home Security states in the house that according to his advice no known material "will deal more effectively with a magnesium incendiary bomb and the resultant fire than water."

Eliminating the Time Factor

A CORRESPONDENT of ours comments on what he describes as the "artfulness" of the above statement; the operative words being: "and the resultant fire." It is perfectly true that there is nothing like water for putting out fires that result from the thermal activity set up by the detonation of magnesium incendiary bomb. We have, however, heard and read a great deal about fire-watchers, and if these defenders of our cities do their job properly, and with adequate tools, there should not be any "resultant fire" to tackle with the stirrup pump or other method of applying water. Sometimes, indeed, the water isn't there, or the apparatus may go wrong, as many testers

of the domestic stirrup-pump have found, to their dismay; and at the best of things a considerable time factor is involved. The application of the fire-extinguishing powder is, however, the work of a moment and can be done the instant the fire is located. Provided, therefore, that the powder really does the job—and tests have proved that it does—it seems unfair, to say the least of it, that its purchase by public authorities should not qualify for an A.R.P. grant. Perhaps the best testimonial to its efficacy is the fact that many public authorities use it, despite official disfavour.

Croatian Copper

THREE may be some advantage in being a junior partner of the Axis; but it is quite certain that there are many drawbacks, not the least of which is the exposure of one's property to "legalised" pillage for the benefit of the senior partner. The latest victim of Croatia, which, according to a Reuter message from Istanbul, is being sacked by the Germans for copper. The copper mines have been expropriated, all copper coins have been withdrawn from circulation, and the registration of copper, brass, and bronze utensils (not forgetting church bells) has been ordered. Frankly, we are surprised that this measure has only now been put in hand. Axis demands for copper are extensive, and a report was circulated last year that the Bor copper mines in N.E. Yugoslavia had passed from French to German ownership. That move was, we suppose, inevitable, as the Bor mines lie in the Timok valley, the "Serbian Ruhr," near the Bulgarian frontier in an area subject to strong Nazi control. The Croatian report, coming on top of this, is in its way encouraging, showing as it does that the Nazis are forced to search byways as well as highways for their essential metals.

Some New American Patents

A Variety of Applications

[FROM A SPECIAL CORRESPONDENT.]

A PROCESS which would greatly increase the amount of crude oil obtainable from wells has been developed by Dr. Ernst Berl of the Carnegie Institute of Technology, Pittsburgh, and is the subject of U.S.P. No. 2,267,548. The patent points out that the extraction of oil from the earth has heretofore been incomplete. After a well apparently ran "dry," tests have shown, Dr. Berl states, that as much as from 20 to 70 per cent. of crude oil still remained in the mother limestone or sandstone. The oil so locked up was considered lost for all practical purposes. In order to release it, it is proposed to pump into the earth adjacent to the well, water treated with wetting agents, among which are included certain dyes. The "wetter" water is claimed to release the residual crude oil from the rock, and the released oil then flows together into a pool from which it may be pumped to the surface in the usual way. As wetting agents Dr. Berl mentions not only dyestuffs such as crystal blue, methyl violet, and alizarin yellow, but also ordinary soaps. They are added to the water in a concentration of from 0.1 to 5 per cent.

Non-Aging Steel

A patent granted to Clarence Altenburger and assigned to the Great Lakes Steel Corporation, Ecorse, Mich., covers a process for extracting from steel the nitrogen which, when present above a certain amount, causes the steel to age. According to the patent, the steel treated by the process is free from "strain aging," a weakness which attacks structures that undergo repeated strains and stresses. Steel made by the new process has its tensile strength increased by as much as 11,000 lb./sq. in.

The secret of the new process lies in annealing the steel with hydrogen. The steel is placed in a furnace, the gases in which are replaced by hydrogen. It is then heated to the usual annealing temperatures, when the hydrogen reacts with nitrogen in the steel, extracting it in the form of ammonia. By thus removing all nitrogen in excess of

0.002 per cent., non-aging properties are imparted to the metal.

Purifying Magnesium

A single-operation process of obtaining magnesium pure enough to resist corrosion has been patented by Charles Nelson and assigned to the Dow Chemical Company, Midland, Mich. The presence of iron, nickel, or copper impurities increases the rate at which magnesium corrodes, and it is stated that earlier methods of purifying, as by repeated distillation, failed to remove all such impurities. The new single-operation method, on the other hand, is said to permit recovery of pure magnesium from scrap, broken and worn-out castings, and alloys. The method involves first contacting the magnesium with lead, tin, bismuth, calcium, silicon, or antimony. Heat is applied to cause the magnesium to alloy with any particular metal selected. The heating is continued until the magnesium vaporises; the vapour is passed through a filter bed of calcium oxide or aluminium oxide, and finally condensed to metal form in a tube through which cold water is circulated. The resulting precipitated magnesium is said to be free from the impurities.

Vapour Bubbles Removed from Glass

The Pittsburgh Plate Glass Company has had assigned to it a new patent whereby carbon monoxide may be used to "sweep out" from glass the gases and water vapours which would normally be trapped as bubbles. The glass thus refined is free from bubbles and possesses a high degree of transparency which makes it highly suitable for the manufacture of optical lenses, plate glass, and marbles from which glass fibres are spun.

In the refining process the glass is melted to a temperature of 1200° C. and carbon monoxide is bubbled through it until a brown coloration results. The depth of the colour is a measure of the thoroughness with which the gases have been removed from the glass. The next step is to bubble air through the glass to eliminate the brown coloration, and finally the molten glass is allowed to stand in a quiescent state to permit escape of gas and water-vapour bubbles swept out by the carbon monoxide.

THE POLAROGRAPH

Its Application to Industrial Chemical Analysis

by DAVID L. MASTERS, M.Sc., Ph.D.

ACHEMIST of a generation ago, if suddenly transported into our midst, would undoubtedly be somewhat bewildered by the wealth of instrumental means at the disposal of chemists to-day. His bewilderment would, one imagines, be tinged with envy, born of the variety of approaches to any analytical problem. This revolution in analytical methods owes no little debt to developments in physical chemistry. The roll of honour of physico-chemical techniques which have enabled us to devise entirely new attacks is long. It includes procedures which are, to-day, widely known and widely accepted as sound practice: spectrum analysis, both qualitative and quantitative, colorimetry, turbidimetry, chromatography, electrodeposition, conductometry and potentiometry, X-ray and electron diffraction are worthy examples which spring to mind in this connection.

One of the latest additions to this list of aids to chemical analysis has been widely publicised in the last few years. Polarography, which had its inception in the early nineteen-twenties, has only comparatively recently been brought to the notice of English-speaking chemists in general. The reactions to it have been very diverse. At first it was suggested that here was a procedure which, when fully developed, seemed likely to displace the chemist by providing a purely mechanical analytical treatment. Apparently, so rumour ran, analysis would in future be merely a matter of pressing a button. An untrained assistant would feed in an unknown at one end of an apparatus, reading off the result at the other end. There was a trace of conviction in the joke that the machine might even be improved so that it would give the results neatly typed at the other end, thus eliminating entirely the taint of human fallibility.

It was only natural that there should be a reaction to grandiose suggestions of this nature; and as a consequence many chemists treated polarographic technique as a quack method to be avoided. It is therefore only a short time since the polarograph as applied to legitimate analytical problems has begun to take its proper place in the chemical world. The purpose of this article is to review briefly the basis, aims and scope of polarographic analysis, and to consider its application to a number of problems that are of interest to the industrial chemist.

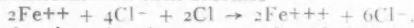
The Theory of Polarographic Analysis

Broadly speaking, polarography makes use of the reduction and oxidation phenomena which take place at an easily polarisable electrode in an electrolytic cell. In order to grasp, however, the numerous cases which this definition covers, it is necessary to remember that the modern view of oxidation is much wider than that of the addition of oxygen to or the removal of hydrogen from a substance. This is easy enough to accept in a reaction such as the conversion of ferrous ions to ferric ions. The process



is generally taken to involve oxidation in spite of the fact that neither oxygen nor hydrogen is concerned. In the same way, the deposition of a metallic silver mirror by the action of an aldehyde on silver nitrate has for many years been commonly termed reduction—we divide sugars into two classes, reducing and non-reducing, on a similar basis. Yet the reaction $\text{AgNO}_3 \rightarrow \text{Ag}$ has not, superficially, any hint of the classical conception of reduction.

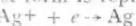
In order to discover the true nature of these phenomena, we must express them as electronic reactions. The ferrous-ferric transformation then becomes



Obviously, there has been a transfer of electric charges, and dealing only with the iron ions the equation may be simplified to

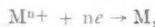


indicating that in oxidising ferrous ions to ferric ions a loss of electrons is involved. In like fashion, the silver reduction in its simplest form is represented



The reduction has been brought about by an addition of electrons.

Using this wider sense of oxidation and reduction we are able to see why oxidation-reduction phenomena can be related to electrode processes. Both involve electron transfer. It is also obvious that polarography, as defined above, must have a very wide range of possibilities. For in every case in which a metal is deposited from solution on the cathode of an electrolytic cell, the reaction occurring is



and therefore a reduction has taken place.

Researches dealing with electrolytic phenomena at the cathode formed the earliest application of polarographic analysis, but the oxidation reactions which may take place at the anode of an electrolytic cell have more recently been the subject of investigation. Organic reductions and oxidations which may be carried out electrolytically have also been studied, and now we can say that any substance which may be reduced or oxidised (in the widest sense) electrolytically, is a possible subject for analysis by the polarograph. It is worth remembering that the reduction of a metallic ion may go through several stages, as exemplified by



Current-Voltage Curve

It is well known that when a small electric potential is applied to an electrolytic cell it does not necessarily follow that a current will pass. In actual fact, the potential may be increased gradually up to a certain voltage without any appreciable current flow. As a consequence, none of the electrolytic phenomena will take place until this point, normally the decomposition potential of the electrolyte, is reached. At the decomposition potential electrolysis begins, and this is accompanied by a large increase in current. Describing the occurrences in oxidation-reduction terms, and considering for simplicity's sake only the immediate neighbourhood of the cathode, the phenomena are as follows.

No current passes until the potential applied is powerful enough to transfer electrons. In an appropriate case this marks the onset of the reduction reaction, and is accompanied by deposition of metal. At the same time, of course, it implies the passage of current which is the outward sign of the electron transfer. The amount of current

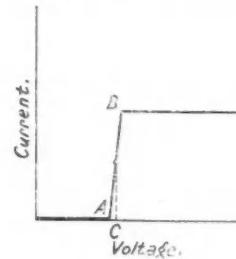


Fig. 1.

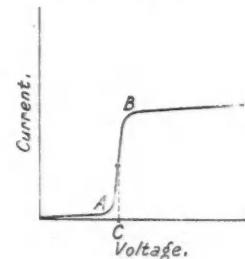


Fig. 2.

passing now increases rapidly until all the reducible ions in contact with the electrode at any one time are immediately reduced. When this is the case, a state of equilibrium has been attained, and further increase of voltage does not produce any marked increase of current. The theoretical curve which is obtained by plotting current

against voltage throughout this series of changes is shown in Fig. 1. In actual practice a result rather more like Fig. 2 is usually obtained experimentally. The point A marks the onset of reduction, and the point B the stage where equilibrium has been established.

Where several reducible ions are present in the solution, the complete curve obtained will, in the simpler cases, be of the nature of Fig. 3. The reduction of the first reducible ion is denoted by AB. This followed by reduction of the second ion at CD and the third at EF. Finally, if the voltage is increased sufficiently, the solvent itself will begin to decompose, and this is marked by the final rise GH. Any subsequent increase in voltage is accompanied by a comparatively large current increase.

It is on the recording of these phenomena that the use of polarography as an analytical method depends. The voltage at which an ion is reduced, usually termed the "half-wave potential," (*i.e.*, corresponding to the point half way along the current-voltage "wave") and denoted by the point C in Figs. 1 and 2, is characteristic of the ion under a fixed set of conditions (solvent, temperature, electrode, nature, etc.). In Fig. 3, *x*, *y*, and *z* denote the half-wave potentials of the three ions. Therefore the half-wave potential is a qualitative guide to the ions in a solution. The height of the wave, which, as we have seen, is dependent on reaching a state of equilibrium around the electrode, must obviously have a direct relation to the concentration of the ion which is being reduced. Therefore,

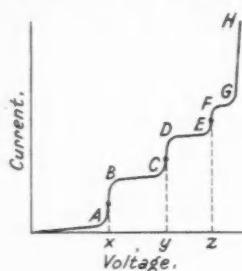


Fig. 3.

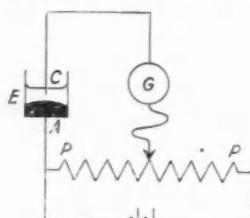


Fig. 4.

If suitable conditions exist, the current-voltage curve provides both qualitative and quantitative information directly.

Polarography is merely an instrumental procedure by which the current-voltage curves are recorded or otherwise determined. Therefore the polarograph, by giving data on the reduction phenomena at the cathode, gives a direct analysis of the solution which is subjected to it.

Limitations of the Technique

At first sight it would seem that limitless opportunities are opened up for the use of this procedure. Brief consideration will show, however, that there are a few drawbacks. Taking into account only inorganic analysis, there are approximately fifty cations to be dealt with. The voltage range over which the polarograph is normally used is roughly +0.8 to -2.4 volts reckoned against the hydrogen electrode (or +0.6 to -2.6 volts where the saturated calomel electrode, the more usual standard, is applied). If the half-wave potentials of the fifty cations were evenly distributed throughout the range, which is by no means the case, this would mean that the maximum separation would be about 0.06 volt. This figure is still further reduced by the existence of more than one half-wave potential for the ions of metals which may exist in several states of oxidation, such as iron and copper. A further series of half-wave potentials characterises the elements if they are present as complex ions such as the cuprarnonium ion.

Now, it is generally accepted that in order to be able to distinguish satisfactorily the waves given by two electrode reductions, the separation of the half-wave potentials must be greater than 0.1 volt; this figure may require to be substantially increased where one ion is present in large excess. It is immediately clear, then, that it is impracticable to take an unknown and subject it to direct polarography without any preliminary knowledge of its composi-

tion. The extension of polarography to the organic field is an additional source of complication, since a further series of half-wave potentials is added. And many organic electro-reductions have not been fully studied as yet.

The Instrument

As has already been indicated, the polarograph comprises essentially an electrolytic cell and a method whereby the alteration of current with voltage may be determined. The essential circuit for such a system is shown in Fig. 4. The electrolytic cell is represented diagrammatically at E, while the cathode and anode in the more usual applications of polarography are shown respectively by C and A. The voltage applied from the accumulator B may be increased progressively from zero by means of the potentiometer P. The current passing through the electrolytic cell is measured by a sensitive galvanometer G.

In order to avoid complications introduced by the second electrode, the anode must be large and non-polarisable. In early work a large pool of mercury at the bottom of the cell performed this duty, but nowadays it is more usual to employ a saturated calomel electrode² connected by an agar bridge to the vessel containing the electrolyte. The cathode is almost invariably (although not necessarily) a dropping mercury electrode, since this presents a constantly clean and exactly reproducible electrode surface which can be readily controlled. It has the additional advantage that the high cathodic overvoltage of hydrogen on mercury enables the greatest possible range of aqueous solutions to be covered by the polarograph without breakdown of the solvent.

The current-voltage curves were originally determined by a series of consecutive measurements. This procedure still has the advantage of avoiding additional expense in the erection of the necessary apparatus. It is also still claimed to give the maximum accuracy. However, it renders determinations extremely tedious, and involves the time factor which is of major importance industrially. In 1925, Heyrovsky and Shikata introduced automatic recording.³ Making use of a gramophone motor which rotated a photographic recording drum synchronously with the slider of the potentiometer, and employing a mirror-galvanometer to cast a beam of light on a slit behind which the drum revolved, they were enabled to obtain direct records of the deflection of the galvanometer, and hence of the current passing. By gearing the drum and the potentiometer so that one complete rotation of the drum corresponded directly to the full range of the potentiometer, the records produced were plots of current against voltage on a predetermined scale, similar in general nature to that depicted in Fig. 3. The photographic method of recording, and recording by pen, a method which enables the complete record to be exposed to view throughout an analysis, are now widely used in preference to manual operation and subsequent plotting of the results.

(To be continued.)

RESIN-IMPREGNATED TISSUES FOR BEARINGS

In order to save imported metals, German engineers have long worked with plastic bearings, but it was found that the parts adjoining the metal were generally unable to withstand high pressure for any length of time. More satisfactory results are claimed to be obtainable if synthetic resins are used in connection with linen, asbestos, glass, wool, or other tissues in the form of resin-impregnated layers varying in thickness down to $1/12$ in. These are wound round the metal, secured to the metal surface by pressure, and hardened afterwards. If suitably formed, such pressed resin bearings bore comparison with lead bronze and light metal bearings; they were inferior to these in the matter of heat and tear resistance, but superior owing to the absence of corrosion, constant surface hardness within a temperature range from -180° to $+135^{\circ}$ C., and high adsorption of oil and fat molecules. The pressed resin bearings have been tried in several types of aero engines on crankshafts at 2200 r.p.m. and are stated to have stood up well under experimental conditions.

Fire Extinction Methods

Inexplicable Attitude of Government Officials

MR. HERBERT MORRISON stated in the House of Commons recently that he was advised that there is no known material which would deal more effectively with a magnesium incendiary bomb, and the resultant fire, than water; nor would the addition of any known composition to the water materially increase its effectiveness. He had, however, no powers to prohibit the manufacture and sale of such materials or liquids.

An Expert's Opinion

As Mr. Morrison's information seemed to imply that he was not completely *au fait* with current knowledge of chemical fire extinguishers, we consulted an expert on the subject, Mr. G. Harold Durston, of Durston, Lang & Co., Ltd., fire protection specialists, and the following are extracts from his reply:

"The question of the use of water is always, you will notice, combined with the effect on the resultant fire, and this is where the Ministry of Home Security combines artfulness with pigheadedness, because in the early days, when there were no fire-watchers, the incendiary bomb might not have been discovered until you had burning metal and a resultant fire, in which case water used properly might, to be perfectly honest, be better than anything else that was then available. Water, however, to be effective must be available, and even the stirrup pump requires man-power, and, of course, intelligent use.

If you have the man-power and the apparatus it does not necessarily follow that the apparatus will work properly, and in this connection I recall to mind a demonstration staged at a big show, where many of the stirrup pumps would not work at all, and some more would not work properly at first, and when ultimately they were used the whole procedure was a farce. Water, of course, accelerates the combustion of magnesium, and can increase the danger. The question resolves itself into one of provision of water, man-power, horse-power (petrol) and time, the last being the most important feature in all fire fighting.

Against this we have one tested and proved material known as "DX" Powder, which can be applied by any single person and which will, in most cases, rapidly and completely extinguish the ordinary magnesium incendiary bomb. "DX" Powder will also extinguish burning sodium, for which purpose water is useless. This statement can be proved by the fact that in actual air raids "DX" Powder has been used by our customers with complete success, and these people are not necessarily experts. Of course you will realise that no hard and fast rule can be laid down for extinguishing a fire with any medium, and that the actual circumstances have to be dealt with as they arise."

Messrs. Durston, Lang and Co., Ltd., have submitted their "DX" Powder to the tests of officials of the Ministry

of Home Security and the Ministry of Supply. With the first-mentioned department, although it was admitted that the bomb was extinguished, the department refused to accept the company's proposition that their representative should be present at the test, and stated (without giving a reason) that in their opinion the instructions of application were impracticable. With the Ministry of Supply, the demonstration was successful and the Director of Scientific Research of the Ministry was asked to observe further tests. It is understood that he was favourably impressed by these tests, which were of a particularly severe nature, but of his official reports no indication has been given.

The company claims that the "DX" Powder has not had a full and fair consideration by the Ministry of Home Security for use in extinguishing magnesium incendiary bombs, and additional to any demonstrations required would ask for consideration to be given to the following factors: (a) The powder definitely extinguishes burning magnesium. It was produced for this purpose and is very extensively used in the light metal industry. (b) The powder is a first-aid measure and requires the use of only one operator. It is supplied in handy containers capable of dealing with three magnesium incendiary bombs. (c) Since the promulgation of the Fire Watching Order, guards are at hand in order that fire bombs shall be tackled immediately they fall. This is a time at which the powder can be most efficaciously and quickly applied. (d) The powder does extinguish magnesium incendiary bombs and at the present time when every possible means of fighting incendiary bombs should be available no deterrent should be put in the way of the use of the Powder by the public.

The Authorities are Adamant

The company made one attempt in a certain quarter to get the position cleared up, but do not at this stage desire to disclose the source, from which, however, they received a reply, of which the following is an extract: "The position is that there are strongly held administrative views that the use of extinguishing powders is not to be encouraged. This is in accordance with public pronouncements. As the authorities concerned are adamant about the matter, I feel I cannot be of any help to you, however much I should like to be."

This is, in effect, an admission that the Ministry of Home Security is determined to prevent any medium other than the stirrup pump from being used for fighting incendiary bombs. The position resolves itself into a state where a Government department adopts a deterrent attitude against a known and tested medium and refuses to recognise its achievements. It is, of course, realised that it is simpler, for the bureaucracy to follow in the well-worn grooves of precedent rather than to show initiative and take advantage of new ideas and inventions.

AUSTRIAN SCIENTISTS

An Association has recently been formed with the aim of rallying all Austrian engineers, chemists, and scientific workers living in Great Britain. The main activities of the Association will be to assist and sponsor members in their professional work and interests, to represent them to the authorities, and to promote relations with British colleagues and thus form a link with British scientific and technical institutions. Courses of lectures and discussions to be held will give opportunity to exchange views and discuss matters of common interest. It is hoped that the Association may ensure that better use is made of the knowledge and abilities of Austrian engineers, chemists and scientific workers who are eager to do their best for the war effort. The acting chairman is Dr. F. Ehrenfest-Egger, and inquiries should be addressed to the hon. Secretary, Mrs. K. Hilfreich, 133 Hatherley Court, London, W.2.

ACETYLENE FROM COAL GAS

Illuminating gas, containing 21.2 per cent. carbon monoxide, 47 per cent. hydrogen, 17 per cent. methane, 9 per cent. nitrogen, and 2.4 per cent. higher hydrocarbons, yields acetylene when exposed to a high-frequency arc discharge, according to Briner, de Werra and Jacob (*Helv. Chim. Acta*, 1941, 24, 1010). It is necessary to operate in vacuum (below 200 mm. pressure) to avoid fouling the electrodes with soot formed by carbonising the hydrocarbons. The yield of acetylene is improved by spacing the electrodes well apart, with correspondingly low current density. Thus, with electrodes 15 mm. apart the current density was 115 mA. and the yield of acetylene was 105.5 g. per kWh. With electrodes 25 mm. apart and proportionately lower current density the precision of the measurements was less, but the yield rose to approximately 180 g. per kWh. Copper electrodes were used in most of the tests, but aluminium electrodes gave a more stable arc.

Personal Notes

MR. JAMES DAWSON, who is managing director of Pinnington, Dawson and Wood, Ltd., has been elected a J.P. for the County Palatine of Lancaster.

SIR KENNETH LEE has been appointed by the Minister of Supply to be Director General of the Raw Materials Controls, in place of SIR GEORGE BEHARRELLI, who has resigned on account of ill-health.

MR. GEORGE EDWIN BAILEY, C.B.E., M.I.Mech.E., who is a director of Metropolitan-Vickers Electrical Co., Ltd., of Associated Electrical Industries, Ltd., and other companies, has been granted the honorary degree of M.Sc. by Manchester University. Mr. Bailey is President of the Institution of Production Engineers.

SIR CECIL WEIR has been appointed Director-General of Equipment and Stores in the Ministry of Supply, in succession to the late Sir William T. Wilson. Sir Cecil Weir's post of Controller-General of Factory and Storage premises in the Board of Trade is being taken by Mr. P. A. WARTER, Deputy Controller-General.

Obituary

ALDERMAN ALFRED GATES, managing director of the Liverpool Central Oil Co., Ltd., died on May 23 at Thornthwaite, near Kendal, aged 74. He had been a magistrate since 1929, and was elected an alderman in 1935, having been Lord Mayor of Liverpool from 1932-33.

MR. ANDREW CRAWFORD, J.P., died recently at Riddington, Notts, aged 93. In 1882 Mr. Crawford founded the Bestwood Coal and Iron Company, of which he subsequently became chairman and managing director; and in 1908, with members of the Lloyd family, he was responsible for building the blast furnace at Corby, Northants, which has since developed into the huge iron and steel firm of Stewarts and Lloyds, Ltd.

New Control Orders

Cobalt Ores and Salts

STARTING on May 23, licences are required by importers or manufacturers to dispose of cobalt and certain specified materials containing cobalt imported into or produced in the United Kingdom. The material cannot be acquired from the importer or manufacturer unless he has a licence or unless the acquirer is authorised by licence. This is the effect of an order issued by the Ministry of Supply, the Control of Non-Ferrous Metals (No. 10) (Cobalt) Order, 1942 (S.R. & O. 1942, No. 938, price 1d.).

The specified materials are cobalt-bearing ores, concentrates, and mattes, residues from which cobalt can be recovered, cobalt metal, cobalt oxides, and the following salts of cobalt: acetate, ammonium sulphate, carbonate, chloride, hydrate, nitrate, phosphate, sulphate.

Purchase Tax Changes

Consequent upon the publication of the Third Supplement to the British Pharmaceutical Codex, 1934, the following decisions as regards liability to Purchase Tax are published as supplementary to those already given in Customs and Excise Notice No. 78.

Chargeable in all circumstances: ammonium mandelate, calcium mandelate, sodium mandelate.

Chargeable when put up for medicinal or veterinary use: alum, benzyl hydroxybenzoate, cetyl alcohol, chloroxylenol, ethyl hydroxybenzoate, methyl hydroxybenzoate, nicotinic acid, propyl hydroxybenzoate, ricinoleic acid, and sulphurated potash.

Lime, Methylene Chloride, Citric Acid

Under the Export of Goods (Control) (No. 24) Order, 1942 (S.R. & O. 1942 No. 929, price 1d.) which comes into force on June 9, licences will, in future, be required to export lime and methylene chloride. The existing control has been extended to cover the salts of citric acid.

Chemical Matters in Parliament

Lime for Farmers

IN the House of Commons last week, Mr. R. S. Hudson, Minister of Agriculture, stated that the Government had had under urgent consideration the question of the maintenance of lime supplies for farmers for the 1942-43 season. In view of labour problems in the lime industry and the increasing demands of essential industries other than agriculture for lime, limestone, and chalk, there might be a serious shortage in the total supplies available for agriculture in the winter liming season unless farmers took substantially more of their lime requirements this summer than they had hitherto done.

As an emergency measure, therefore, it has been decided to make a summer delivery payment to farmers. This payment will be equivalent to an increase in the rate of Exchequer contribution under the Land Fertility Scheme from 50 per cent. to 75 per cent. and will be payable in respect of the cost of deliveries made under the scheme and received by occupiers of agricultural land during the period from May 18 to August 31 inclusive.

Low-grade Phosphate Deposits

Mr. Wootton-Davies asked the Minister of Supply whether he could give any information as to the steps he was taking to increase the production of home-produced phosphatic manures. Mr. Peat replied that the production of ground basic slag had been substantially increased during the war, and it was proposed to install additional grinding plant to treat the total quantity of slag available. In addition, the practicability in present conditions of working certain low-grade phosphate deposits in the country was under investigation.

British Chemical Prices

Market Reports

SUSTAINED activity has been reported from most sections of the chemical market during the past week, and delivery specifications continue to cover good volumes. A strong price position is maintained throughout the market. Among the soda products the demand for bichromate and chlorate is in excess of available supplies and in the potash section a tightness in supplies is the chief feature. The demand for oxalic, acetic, tartaric, and citric acids is greater than the quantity on offer, while elsewhere formaldehyde and acetone continue in good request. A steady trade is passing on the coal-tar products market and deliveries of carbolic acid, cresylic acid, and creosote oil are proceeding satisfactorily, although a fairly substantial export business is held up owing to the lack of shipping space. The demand for pitch is about moderate and xylol remains quiet.

MANCHESTER.—There is rarely the least sign of easiness on the Manchester chemical market and the general tendency is strong. Holiday influences at the beginning of this week have had their inevitable effect both on the volume of new business and on the movement of contract supplies, but most people agree that, on the whole, the effect has been less in evidence than usual. The heavy acids are in good demand, and delivery specifications for the leading alkalis and the magnesia and ammonia compounds have been fairly good. Xylol, among the tar products, is still not too steady, but other materials are mostly in good demand and values are firm.

GLASGOW.—Business in the Scottish heavy chemical trade has shown a slight improvement during the past week for home business. Export trade is still very limited. Prices remain very firm.

Price Changes

Alum.—Loose lump, £14 10s. per ton, f.o.b.

Naphtha.—Solvent, 90/160, 2s. 2d. to 2s. 6d. per gal.; heavy, 90/190, 1s. 10d. naked at works. **M**ANCHESTER: 90/160, 2s. 2d. to 2s. 7d. per gal.

Pitch.—Medium, soft, 45s. to 55s. per ton, f.o.b. **M**ANCHESTER: 42s. 6d. per ton at works.

Xylo.—Commercial, 3s. per gal.; pure, 3s. 2d. **M**ANCHESTER: 2s. 9d. to 3s. 2d. per gal.

General News

The leaflet on the methods for the detection of carbon monoxide (No. 7 in the D.S.I.R. series, "Toxic Gases in Industry") has been reprinted at the revised price of 2s. 6d. (2s. 7d. post free from H.M. Stationery Office or booksellers).

An Industrial Truck Manufacturers' Association has been formed with a view to the standardisation of these vehicles. They play an important part in the distribution of materials and products at factories, and increased uniformity would help to speed up the war effort.

Work has started in Wicklow on iron-pyrites mining for production of sulphuric acid, under the direction of the Mineral Exploration and Development Co. It is hoped that the output of this mine, together with output of the County Clare phosphate deposits, will provide about a quarter of the quantity of super-phosphates normally used in Eire.

Wax polishes, creams and dressings for floors, furniture and shoes have been allotted, for the period June 1 to July 31, 1942, an effective quota of 20 per cent. by value under the Limitation of Supplies (Miscellaneous) (No. 13) Order, 1941. Application for registration should be made immediately by all manufacturers of controlled goods of this class. A further announcement will be made regarding the arrangements which will come into force on August 1, 1942.

Research into the manufacture of formalin, carried out by the Eire Emergency Scientific Research Bureau, has proved successful and sufficient supplies are now being produced in Eire to meet essential demands. Following laboratory investigations and experiments on a pilot plant, a plant was constructed at the Riverstown (Louth) distillery of the Irish Industrial Alcohol Company, for the production of formalin by the catalytic oxidation of methyl alcohol. The plant was operated by the Bureau's staff for a few weeks, during which time three tons of formalin were produced. It has now been taken over for commercial operation by the owners of the distillery.

The Waste Paper Recovery Association believes that there is an enormous tonnage of paper hoarded by firms or individuals under the impression that they must retain certain documents for six years. The fallacy of keeping bank vouchers has been shown in a recent statement of the Association; they carry little weight in the court as evidence, and receipts and other documents are not always helpful. The Association therefore asked two leading chartered accountants to write a circular as an approximate guide to the length of time for which documents should be kept, and copies may be had on application to the Association Office, 154 Fleet Street, London, E.C.4.

Foreign News

A maximum price for shellac T.N. has been fixed at Rs.66.8 per maund of 822/7 lb. at Calcutta by the Department of Commerce of the Government of India. At other places and for other qualities of shellac variations are allowed having regard to the normal variations in the prices concerned.

Sales of leaded zinc oxide in the U.S.A., at 68,920 short tons, established a new high record by a wide margin in 1941, and those for zinc oxide (148,833 tons) were the highest recorded since 1929, according to the Bureau of Mines, Department of the Interior. Total sales of zinc oxide (lead-free and leaded) in 1941 had never previously been exceeded.

Although tall oil is not produced in India, as the chemical pulping of pine wood is not carried on there, the Forest Research Institute, Dehra Dun, has published a leaflet on synthetic tall oil in order to encourage manufacturers to produce synthetic liquid rosin from the ample supplies of fatty oils which are available in the country.

Export of molybdenum concentrates from Peru during 1941 totalled 227 metric tons containing 180 tons of MoS₂. In 1941 the entire output was sold under contract to Japan. This contract expired in December, 1941, and the 1942 output will be sold to England. It is reported that the Peru Molibdeno S.A. is planning to increase productive capacity, provided necessary financial arrangements can be made, according to the U.S. Bureau of Mines.

From Week to Week

The need for insecticides in Paraguay is indicated by an advertisement in the local press seeking sources for lead arsenate, sulphur, sodium nitrate, potassium sulphate, and carbon bisulphide. In 1939, the United States shipped 31,300 lb. of agricultural insecticides to Paraguay, but in 1940 the total amounted to only 800 lb.

Maintenance of the effectiveness of chemical fertilisers in well-drained soils has been studied by German research institutes. Of the condensation products of cyanamide and urea with formaldehyde, acetaldehyde, and crotonaldehyde, only acetaldehyde-urea proved sufficiently resistant against draining off to compare as a fertiliser with calcium cyanamide.

A Mexican firm is endeavouring to meet the demands of the railways in paints for bridge and locomotive work. The Government Petroleum Company uses creosote as anti-fouling compositions and anti-rust paint. Other mineral-oil derivatives are used by government departments in anti-fouling compounds. Mercuric oxide and lead oxide are both produced in Mexico, and anti-rust paints are produced with these two ingredients as bases. All special types of paints are imported, as are the colours, partly as liquids or pastes, and partly in powdered form.

The Company for Chemical Industry, Basle (Ciba), reports for 1941 a gross profit of 22.29 (16.09) million Swiss francs and a net profit of 8.20 (5.87) million fr.; the dividend is maintained at 17 per cent., but the Far East hostilities and the tightening of the blockade have induced the company to create a dividend reserve of 2,000,000 francs. Unsatisfactory European business was offset by increased overseas exports. The branch offices in overseas countries have been provided with stocks sufficient to maintain business relations with local customers even if contact should be interrupted. The dyestuffs trade was maintained at 1940 levels, but the increased use of synthetic fibres in Europe forced Ciba to develop new dyes. Good progress is reported for works producing plastics and textile auxiliaries. Among foreign subsidiaries the factories in Bergamo (Italy) and Cincinnati (U.S.A.) reached higher output figures. The commercial position of the Clayton Aniline Co., Manchester, is described as satisfactory, but the works at St. Fons suffered from trade difficulties in occupied France.

Forthcoming Events

At a meeting of the **British Association of Chemists**, to be held in the Rooms of the Geological Society, Burlington House, W.1, at 6.30 p.m., on **June 1**, Dr. A. E. Dunstan will speak on "Pioneers in Petroleum," and his talk will be illustrated by two films.

There will be a meeting of the **Electrodepositors' Technical Society** (Midlands Centre) at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 6 p.m., on **June 2**. The "Electrodepositors' Brains Trust" will hold an initial session on that date, and members are asked to forward questions in advance. (Question Master, Dr. S. Wernick.)

There will be a meeting of the Newcastle-on-Tyne section of the **Society of Chemical Industry** at 6.30 p.m., on **June 4**, in the Chemistry Lecture Theatre of King's College, Newcastle, when Mr. S. J. Tomkeieff will speak on "The Impact of Mineralogy on Chemical Industry."

On **June 8**, at 5.30 p.m., the **Electrodepositors' Technical Society** will meet at the Northampton Polytechnic, E.C.1, when a paper will be presented by Mr. A. Ensor on "The Brytalf Process for the Anodic Oxidation of Aluminium." This will be the last London meeting of the current session.

The 79th annual general meeting of **The Institution of Gas Engineers** will be held in London at 10 a.m. on **June 10**. At 10.25 the presidential address will be delivered by Sir Frederick J. West, chairman and managing director, West's Gas Improvement Company, Limited, Manchester, and at 11 a.m. short papers on "The Gas Industry: Further Considerations on Efficiency and Development," will be presented and discussed. The discussion will be continued after luncheon.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

P.A.C. PHOTOGRAPHIC ACCESSORIES AND CHEMICALS, LTD., London, E.C. (M., 30/5/42)—May 4, debenture securing to New Trading Co., Ltd., all moneys due or to become due from the company to the holders; general charge, £2,000. Dec. 31, 1941.

KANTEX (PLASTICS) LTD., London, E.C. (M., 30/5/42)—May 6, £4500 mortgage to John Laing and Son, Ltd., charged on land and buildings at Elstree Way and Manor Road, Elstree. *—March 13, 1939.

SAVORY AND MOORE, LTD., London, W., chemists. (M., 30/5/42.) May 7, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank, charged on stock in trade and book debts (in priority to charge dated June 12, 1933). *£271,675. Jan. 5, 1942.

Company News

Stewarts and Lloyds of South Africa, Ltd., report a dividend of 3 per cent. on the 6 per cent. first cumulative preference shares for the half-year to June 30, 1942.

Milton Proprietary, Ltd., John Milton House, 10/12 Brewery Road, N.7, announce that the name of the company was changed to Milton Antiseptic, Ltd., on May 9.

The British Thermostat Co., Ltd., report profit for year ended January 31 of £49,124 (£67,598) after taxation, and have declared a final dividend of 11 per cent., making 18½ per cent. (same) for the year.

Griffiths Hughes Proprietaries, Ltd., have declared a final dividend of 4 per cent., making 6 per cent. for the year (3 per cent.). The operating company also reports a profit for 1941 of £230,910 (£138,646).

New Companies Registered

Lords Plastics, Ltd. (373,861).—Private company. Capital: £300 in 300 shares of £1 each. Manufacturers of and dealers in commercial plastic materials, synthetic resins, moulding powders, varnishes, lacquers, gums, laminated sheets, etc. Directors: R. F. Mottershead; Mrs. H. Mottershead; Agnes Bulcock. Registered office: 14 Tontine Street, Blackburn, Lancs.

Burgoyne Oils (1942), Ltd. (374,029).—Private company. Capital, £500 in £1 shares. Manufacturers of and dealers in oils, lubricants, grease, tallow, petrol, paraffin, benzol, motor spirit, tar, bitumen, wax and oil fuels, etc. Directors: Wm. C. Burgoyne, J. Mardorf. Registered office, 33 Blackfriars Street, Manchester, 3.

Chemical and Allied Stocks and Shares

STOCK EXCHANGE markets have presented a generally firm appearance, and in numerous directions security values showed further moderate gains on balance. The latter have been followed by very little selling, and, in fact, the amount of business reported was again small. Imperial Chemical at 33s. 6d. were 3d. lower on balance, but have continued to hold most of the rise which followed publication of results for the past year's working. I.C.I. 7 per cent. preference changed hands around 35s. B. Laporte, which remained under the influence of the maintenance of the dividend at 15 per cent., were again 63s. 9d., and continued firmly held. Fison Packard were unchanged at 38s. 9d., while Lever and Unilever at 25s. 3d. were also the same as a week ago. In other directions, Dunlop Rubber further improved to 27s., on consideration of the recently-issued results. There was further good improvement in Barry and Staines from 29s. 6d. to 31s. 7½d., awaiting the impending dividend announcement. Nairn and Greenwich

kept at 51s. 3d.; the market expects that the forthcoming interim payment is likely to be unchanged.

In other directions, Imperial Smelting held their recent rally to 10s. 6d., and Borax Consolidated were also firm feature at 31s. The units of the Distillers Company remained in favour on the assumption that the payment for the past year will be kept at 16½ per cent., and, as compared with a week ago, have risen further from 75s. 3d. to 77s. at the time of writing. Securities of companies with interests in plastics were again fairly active; British Industrial Plastics 2s. ordinary changed hands at 4s. 1d., while Erinoid 5s. shares were 8s. 3d., and Lacrinoid Products 2s. ordinary were around 3s. 3d. Awaiting the interim payment, which it is generally expected will be maintained, Turner and Newall were again better at 68s. 9d., compared with 68s. 1d., a week back. British Oxygen were 67s. 6d., and better demand for British Aluminium shares resulted in an upward movement of the price to 43s. 6d. At 33s. 3d. British Match have been well maintained. Goodlass Wall 10s. ordinary kept at 8s. 9d., having remained under satisfaction with the unchanged dividend of 6 per cent. Business at 28s. 1d. was recorded in the 7 per cent. preference shares of the last named company. After the reaction which followed the results and annual review, United Molasses 6s. 8d. units have rallied to 28s. 6d., compared with 27s. 7½d. a week ago.

Hopes that the forthcoming dividend may be unchanged were reflected by a further rise to 34s. 3d. in Boots Drug. Timothy Whites were 22s. 1d., and Saugers 15s. 10d.; while Griffiths Hughes were firm at 14s. 1d. on satisfaction with the improved results. Awaiting the dividend announcements, Amalgamated Metal were 14s., and Allied Ironfounders 24s. 3d. Cerebos were £82, "ex" the final payment, which maintains the total payment for the past year at 40 per cent. Elsewhere, the units of Wall Paper Manufacturers further improved to 23s., while Pinchin Johnson rallied from 22s. 9d. to 23s. 1d. Among smaller-priced issues, Lawes Chemical were 8s. 9d., and Greeff-Chemicals Holdings 5s. units were quoted at 5s. 7½d. Business at 7s. 3d. was recorded in William Blythe 3s. shares. Monsanto Chemicals 5½ per cent. preference were 22s. 9d.; among other preference issues, Morgan Crucible 5½ per cent. have transferred at 26s. 6d., and the 5 per cent. around 23s. At 22s. British Plaster Board were better on balance, as were Tunnel Cement at 43s. 9d. In other securities, Stewarts and Lloyds made the improved price of 45s. 9d., and Tube Investments were steady at 82s. Fine Cotton Spinners were less active following publication of the results; rather lower prices ruled for Courtaulds and British Celanese; and oil shares lost part of their recent improvement.

Spanish coke-ovens not equipped with by-product recovery plant must close down, according to a new Government decree. Coke ovens which do possess by-product recovery installations, on the other hand, are to receive sufficient coal for operating at full capacity. Companies wishing to instal by-product plant must present their plans to the Ministry of Industry and Commerce.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

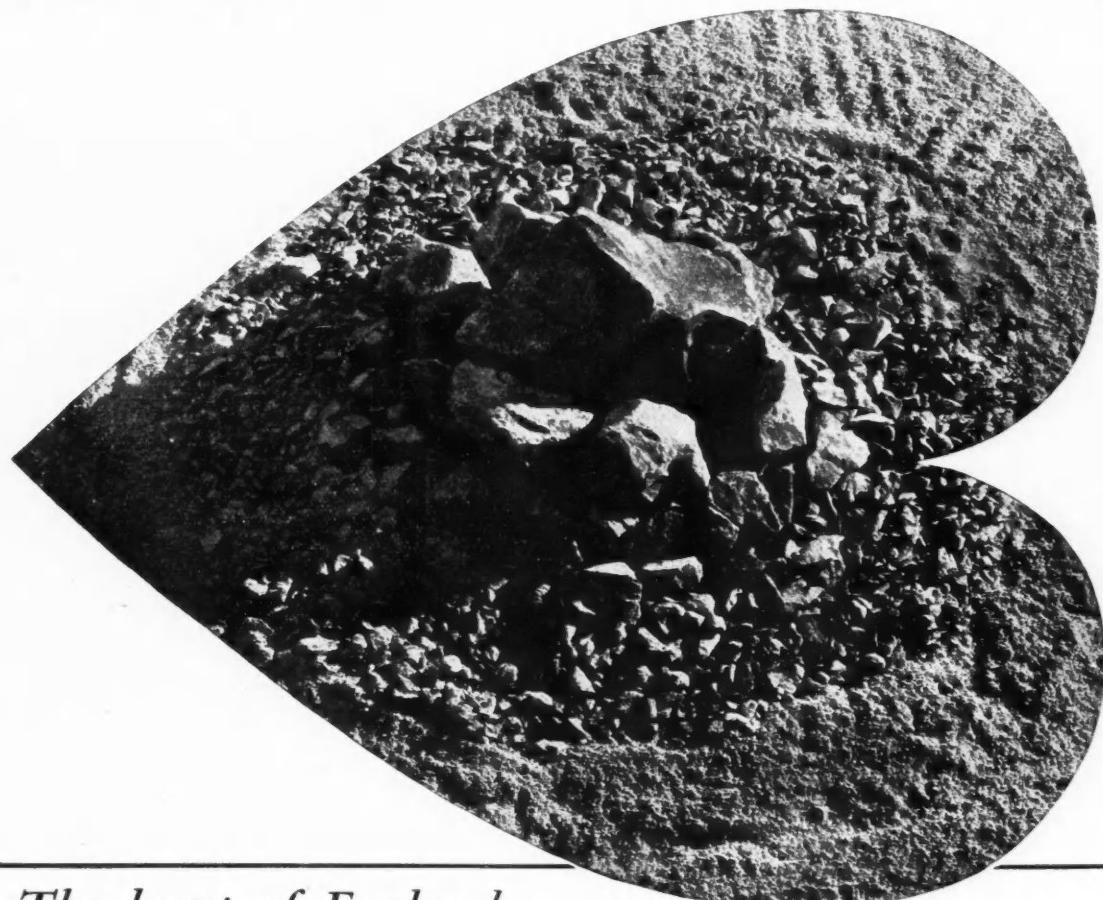
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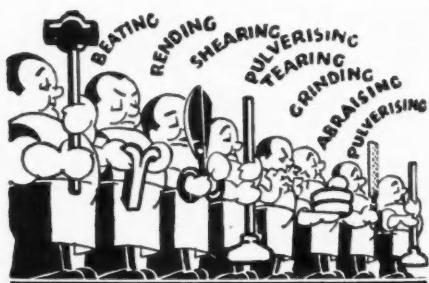
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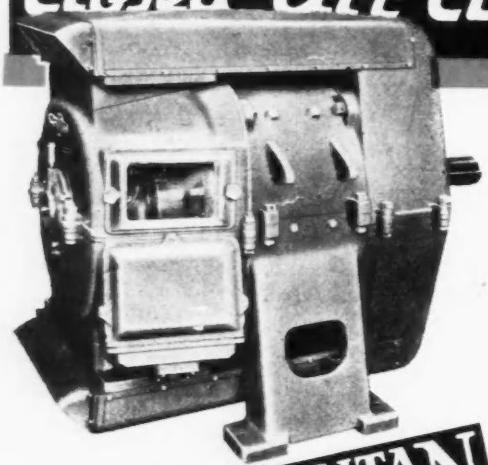
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